Chemical Formulas + Compounds

7.1 Chemical Formula's are v. significant

H_2O ← has 2 H's + 1 O
H_2O_2 ← 2 H's + 2 O's
there is a difference (elephant toothpaste)

Once formulas is made subscripts can't be changed

(formula unit → simplest unit indicated by the formula of any compound)

Formulas mean many things
H_2O → mean 1 water molecule
→ 1 mole of water molecule (6×10^{23})
→ 1 molar mass of H_2O (18 g)

Therefore in rxns & any other aspects the essential to have the correct formula

Making compounds w/ ions → easy

Criss Cross Method → cross charges of ions

monatomic ions – $Na^{+}Cl^{-}$ → Na^{+}_{1} Cl^{-}_{1} → NaCl

$Fe^{+2}I^{-}$ → Fe^{+2}_{1} + I^{-}_{2} → FeI_2

Simple

For polyatomics use parenthesis b/c can't change subscript of ion

$Al^{+3} + SO_4^{-2} \rightarrow Al_2(SO_4)_3$ ← mean 3 sulfate ions

Naming ionic compounds are simple (metal + nonmetal ions) or metal + polyatomic

Name the + ion 1st (usually the metal)

and the − ion 2nd

IUPAC Stock old

Give wkshts
- Criss cross
- my naming wksht (2)

NaCl Sodium chloride

$CuCl_2$ Copper(II) Chloride, cupric chloride

we know Cu^{+2}

NaOH Sodium Hydroxide

Naming Molecular compounds there is a system (pg 210-211)

we have used it b/fore

CO – carbon monoxide

CO_2 carbon dioxide

CCl_4 carbon tetrachloride

prefixes – 1-mon
2-di
3-tri
4-tetra
5-penta
6-hexa
7-hepta
8-octa-
9-nona-
10-deca

Rules – 1. Less e⁻ negative 1st. Only give prefix if more than 1 present.

2. prefix to name for # present

-ide ending

Ex CCl_4, As_2O_5, N_2O, N_2O_3, N_2O_5

Acids + Salts → always H in them

Binary acids → Hydrogen + one of the halogens

Oxyacids H + O + other element
↳ b/c have Oxy anions

H_2SO_4	sulfuric Acid	→ SO_4^{-2}
HNO_3	nitric Acid	NO_3^{-1}
H_3PO_4	phosphoric Acid	PO_4^{-3}

salt → Cation + anion from acid

Naming acids →

Binary → -ide → -ic HCl Hydrochloric acid

H → Hydro Chloride → Chloric

Oxyacids ate → ic ite → ous

H_2SO_4 → (sulfate) Sulfuric acid

H_2SO_3 Sulfite sulfurous acid

(HCO_3) bicarbonate
↖ bi

pg 212 Q 2, 3, 4

p 230 #27, 28, 31

Unit C.3 The mole (Atom counting)

Last unit we worked w/ Really small #'s of atoms

This is impossible to do. Cannot get 1 H_2 molec alone.

6.9 billion people developed.

$\frac{6.022\times10^{23}}{6.9\times10^{9}\ \frac{\text{atoms}}{\text{sec}}} = 8.73\times10^{13}\ \text{sec}$

$8.73\times10^{13}\ \text{sec} \times \frac{1\ \text{hr}}{3600\ \text{sec}} \times \frac{1\ \text{day}}{24\ \text{hr}} \times \frac{1\ \text{yr}}{365\ \text{day}}$

$2.8\times10^{6}\ \text{years} = 2.8\ \text{million years}$

g Unit. made up by chemists to
of particles. It is like the scientific
dozen.

ings 1 doz = 12 things.

If we had 1mol of paper clips ($1\frac{7}{8}$") = 1.78×10^{19} miles go to the moon + Back

Dist to Moon = 2.39×10^{5} miles → 3.72×10^{13} times

to Sun 9.56×10^{7} miles Sun + back

9.3×10^{10} times

93,000,000,000

But 1mol of C = 12.0g of C

↳ means atom is very small!

Mol Conversions

molecules to moles $\times \frac{1 \text{ mole}}{6 \times 10^{23} \text{ molec}}$

moles to molecule $\times \frac{6 \times 10^{23} \text{ molec}}{1 \text{ mol}}$

Do examples w/ student HW give wksht.

then give quick quiz

Molar Mass. We don't use molecules frequently. too small!

we measure in mass g.

Molar mass = # of grams in a mole.

for elements it is the atomic mass in $\frac{g}{mol}$

Ex for C = 12.0 g/mol

N = 14.0 $\frac{g}{mol}$

for compounds → sum to total of all masses

H_2O = 18.0 g/mol

2×1 16

give wksht the give quick quiz

Determing formulas from %

2 types of formulas → empirical formulas – simplest, reduced fully

molecular formula – some multiple of emp. form based on molar mass

$(\text{simple form})_x = \text{mol form}$

$(\text{simple mass})_x = \text{mol mass}$

Ex diBorane B_2H_6 = 78% Boron
22% H

so is BH_3 (although very unstable)

Calculate comps by %'s

B = 78%
H = 22%

All this compound has these %ages
so.. if I have 100g of it should have
78g B + 22g H

LDC – comp has same elements in same prop by mass

to compare proportions must compare moles

B $78g \times \frac{mol}{11g} = 7.1 mol\ B$

H $22g \times \frac{mol}{1g} = 22 mol\ H$

so formula is $B_{7.1}H_{22} = BH_3$
↑ ↑
whole #s